PRATT & WHITNEY AIRCRAFT
DIVISION OF UNITED AIRCRAFT CORPORATION
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CABLE ADDRESS "AIRCRAFT"

OFFICE OF THE GENERAL MANAGER

May 12, 1960

Mr. Charles F. Ducander
Executive Director and Chief Counsel
Committee on Science and Astronautics
House of Representatives
Washington, D. C.

Dear Mr. Ducander:

We appreciate very much your invitation to express our views on supersonic jet transport aircraft development to the United States House of Representatives Committee on Science and Astronautics.

Pratt & Whitney Aircraft's extensive research and development programs have resulted in the ability to supply a number of current production engine models capable of operation at high Mach numbers. For example, although its actual Mach number is classified, the J52 engine used in the Hound Dog missile is capable of operation at high supersonic speeds, the widely used J57 engine has considerable time at Mach 2.0, and the J75 series engine used in the successful F-106 speed record attempt was operated at Mach 2.4. We have expended a great deal of effort over a number of years not only to reach these speeds but to develop the capability of still higher supersonic sustained operation. This work has resulted in the development, under Navy sponsorship, of the JT11 (J58) engine which has already been experimentally operated at Mach 3 in our altitude test facility. In addition, we have maintained a close working relationship with the major aircraft companies on the preliminary design of still further advanced powerplants which might be developed for both military and commercial supersonic aircraft.

Against this background we would like to submit our thoughts for the Committee's consideration.

Research and Development: The single most important technical decision which must be made is whether the supersonic transport should be designed for approximately Mach 2 or for Mach 3. As indicated in paragraph 2, relatively complete technical information is available for a Mach 2 design. The problems, while difficult, are relatively well-defined. A Mach 3 design, however, would require an extension of the aerodynamic and structural art considerably beyond existing proven experience. The development cost of a Mach 3 aircraft probably would be several times that of a Mach 2 aircraft. If the basic reason for proceeding with development of a Mach 3 transport is national prestige, then the results may justify the large increase of additional effort and expense.

Based on actual full-scale operating experience under simulated conditions up to Mach 3, we are confident that a suitable powerplant can be developed for a supersonic transport aircraft within a required time period, that is, a lead time

allowing for an orderly pace through intensive research, exhaustive experimentation and thorough development. The JT11 (J58) jet engine, now under development, could be available in advance of a supersonic transport aircraft initiated at this time.

Financial Feasibility: Most of the supersonic transport studies conclude that the seat-mile operating cost may be comparable to that of current subsonic jet aircraft if development costs are considered separately. It is clear that the development cost of a supersonic aircraft will be of such size that it will need government support.

Operating Potential: The number of aircraft needed would depend of course on the route structures, but the number probably would be small compared to the subsonic jet plane fleet. The aircraft would be designed for nonstop transcontinental and transoceanic ranges to reap increased speed advantage. Greater schedule frequencies and the sharp reduction in travel time, however, would open new markets among a steadily expanding world air-travel population. Cargo possibilities also would be tremendous.

It is our belief that the introduction of a supersonic transport by the civil airlines must necessarily be a careful process. It does not appear at the moment that there will be extensive use of high supersonic aircraft within the military to build up a background of operating experience prior to introduction of supersonic transports. The lack of such valuable background will demand comprehensive development programs with a concentration on endurance testing under simulated flight conditions. It may take several years after the initial flight of the prototype model to achieve commercial safety and reliability standards.

Noise Problems: Airport and in-flight noise problems naturally will require serious study. Powerplant noise stems from the thrust output and hence will vary with the size of the aircraft and its thrust requirements. The thrust available in transonic acceleration, however, will give high performance during climb outs so that the perceived neighborhood noise level should not be too severe. This, of course, will depend on allowable departure procedures and climb paths. Sonic overpressure can result in serious noise problems, but available data indicates that these effects can be alleviated by delaying acceleration to supersonic speeds until a relatively high altitude is reached. From the standpoint of the powerplant, this demands an engine capable of good subsonic climb performance in addition to satisfactory supersonic cruise capability.

National Prestige: In our opinion, the United States commanding position in civilian and military aircraft production would suffer if other countries were the first in supersonic transport development. Several times, in a single generation, the nation has experienced dangerous periods because of the absence of a sustained, forward-working aircraft development program. The same has been true in the case of the decline of American shipbuilding and the mercantile marine program.

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For some time there have been press reports to the effect that the British Government is considering the building of a supersonic transport. Without disclosing details, Duncan Sandys, the British Minister of Aviation, in a statement last February promised a support program for the British aviation industry which included (1) the development and tooling costs for selected civil aircraft and engine projects, (2) proving and other costs involved in introducing new aircraft into service, (3) working capital to back speculative production targets, and (4) general aeronautical research and development work. Sandys is quoted at the time as saying that the support the government is offering would enable the aircraft industry to assume greater risks. Reports from France indicate that the French Government also is considering a supersonic transport program and it is probable that the U.S.S.R. is devoting some effort on a supersonic transport.

The technological initiative represented by the development, production and operation of supersonic transports will enhance the prestige of the country accomplishing it, and give its aircraft and airline industry a marked advantage in world trade.

The United States aircraft industry has a stake in foreign trade. This is economically important, aside from the prestige of having American civil aircraft purchased abroad as well as at home. Foreign sales are a source of revenue the industry would like to retain, a source of employment for scores of thousands of United States workers in the aircraft and related industries. The Aerospace Industries Association of America has reported that in 1959 the United States aircraft industry exported a total of $769,400,000 worth of products. In 1956 the exports amounted to $1,059,300,000.

In summary, we believe that it may be of great importance to our national prestige to develop a supersonic transport aircraft. The technical knowledge exists to construct a practical supersonic transport, but the magnitude of the development is beyond the financial capabilities of private industry.

Most of the critical problems have been recognized and many are well along toward resolution. Pratt & Whitney Aircraft has demonstrated the feasibility of operating turbojet engines at the temperature and pressure conditions of high supersonic flight speeds and has in existence the facilities to carry on this development.

We think it highly important that a decision be made to proceed with the development of a supersonic transport so that the United States does not lose the present technical advantage it now enjoys in the field of high-performance civil aircraft.

We thank you for this opportunity to express our views on this important subject.

Respectfully yours,

PRATT & WHITNEY AIRCRAFT

L. C. Mallet

L. C. Mallet
General Manager

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HYPOTHETICAL COSTS FOR SST POWERPLANT DEVELOPMENT

EXAMPLE I	Total	Co. Share
Development Cost through type test (within amount bid)	$500,000,000	$125,000,000
Development Cost after type test	500,000,000	500,000,000
Production Tooling	25,000,000	25,000,000
Interest (company only)	160,000,000	160,000,000
	$1,185,000,000	$ 810,000,000

EXAMPLE II		
Development Cost through type test (with bid $350,000,000)	$500,000, 00	$212,500,000 *
Development Cost after type test	500,000,000	500,000,000
Production Tooling	25,000,000	25,000,000
Interest	190,000,000	190,000,000
	$1,215,000,000	$927,500,000

*FAA Formula

Amount bid $350,000,000 @ 25% =	$87,500,000
1st $100,000,000 overrun @ 75%	75,000,000
Next $50,000,000 overrun at 100%	50,000,000
	$ 212,500,000